[Time: 2 ½ Hours] [Total marks 75]

N.B. : (1) All questions are compulsory.
(2) Figures to the right indicate full marks.
(3) Use of logarithmic table/non-programmable calculator is allowed.

1. Attempt **Any Three** of the following: 15

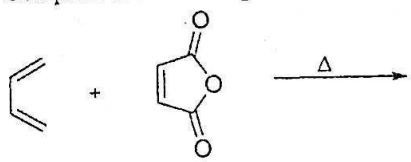
A. a) Discuss the $A_{AC}2$ mechanism of acid catalysed esterification of carboxylic acid. 3

b) Distinguish between basicity and nucleophilicity. 2

B. Give the full form of NGP. Explain with a suitable example the effect of NGP on kinetics and stereochemistry of the reaction. 5

C. a) Explain electrocyclic reaction with suitable example. 3

b) Complete the following reaction and name the reaction involved. 2



D. With the help of neat and labelled Jablonski diagram explain different physical processes associated with excited molecules. 5

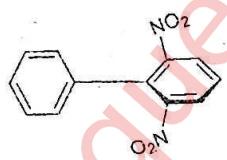
E. a) Explain the mechanism of photoreduction of benzophenone to benzpinacol. 3

b) Explain the Norrish type-II reaction of pentan-2-one. 2

2. Attempt **Any Three** of the following: 15

A. Define molecular chirality. State whether the following compounds are optically active or optically inactive. 5

i)



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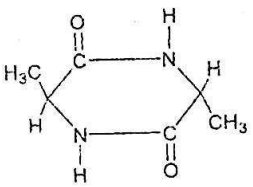

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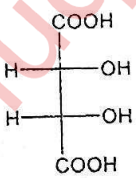

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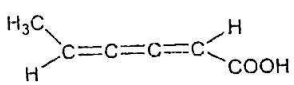
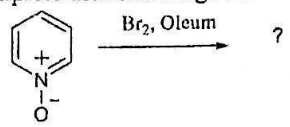


B. Write a note on stereochemistry of biphenyls. 5

C. Explain the Bischler–Napieralski method for synthesizing isoquinoline. Write the chemical reaction of isoquinoline with alkaline potassium permanganate. 5

D. a) Complete the following reactions: 3

i) 

ii) 

iii) 

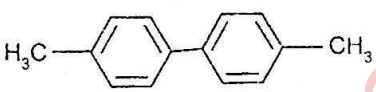
b) Draw the resonating structures of pyridine-N-oxide. 2

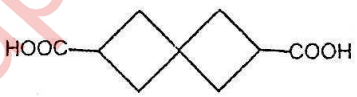
E. a) Write the synthesis of Endosulfan. 3

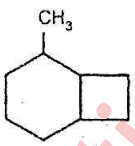
b) What are agrochemicals? Mention its two uses. 2

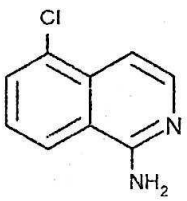
3. Attempt **Any Three** of the following: 15

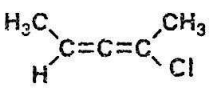
A. Give IUPAC names of the following compounds: 5

i) 

ii) 

iii) 

iv) 

v) 

B. a) Write the structural formula for the following compounds: 3

i) 5-Nitroquinoline

ii) Spiro[3.4]octa-5,7-diene

iii) 1,3-Dinaphthyl-1,3-diphenyl-1,2-propadiene

b) Define regioselectivity and explain it with at least one synthetic example. 2

C. Discuss Biginelli reaction with suitable example. 5

D. a) Define E-factor. In a reaction, for every 44 Kg of ethylene oxide (desired product) produced, 111 Kg of the effluent $CaCl_2$ is produced. Calculate it's E-Factor. 3

b) Explain the use of dimethyl carbonate as methylating agent. Give any one reaction. 2

E. Define phase-transfer catalysis and explain its mechanism briefly with an example. 5

4. Attempt **Any Three** of the following:

A. Write the synthesis of Nicotine from Nicotinic acid. 5

B. What are terpenes? How are they classified on the basis of their composition? 5

C. a) Give analytical evidence to prove that Citral is an α, β - unsaturated aldehyde. 3

b) What are alkaloids? Give any two examples. 2

D. a) Discuss Bathochromic shift in UV spectroscopy with a suitable example. 3

b) State and explain Beer-Lambert's Law. 2

E. Explain the Rule of 13 w.r.t mass spectroscopy using suitable examples. 5

5. **Answer the following:**

A. Select whether the following statements are **true** or **false (Any five)** 5

a. A transition state has highest energy and least stability.
b. Carbonyl compounds containing α-H atom show Norrish type-I cleavage.
c. Fungistatics kill the fungi.
d. Pyridine-N-oxide is not aromatic compound.
e. An ideal synthesis should produce maximum waste and minimum product.
f. A reaction with 100% atom economy will form no by-product.
g. The side chain in Nicotine is N-methyl pyrrolidine.
h. The molecular ion is a radical anion.

B. **Select the correct option and complete the following statements. (Any five)** 5

a. All Electrophiles are.....
i) Lewis acids ii) Lewis bases
iii) Neutral iv) Electron pair donors

b. Conversion of allyl benzene to phenyl cyclopropane is an example of .....reaction.
i) di-π Methane ii) Norrish type-I
iii) Norrish type-II iv) Wittig reaction

c. The rotation–reflection axis involves.....
i) only rotation ii) only reflection
iii) rotation followed by reflection iv) reflection followed by rotation

d. The full form of IAA is.....
i) Indole Amino Acid ii) Indole Acetic Acid
iii) Iso Acetic Acid iv) Indole Alcoholic Acid

e. Partial reduction of nitrobenzene is an example of.....reaction.
i) chemoselective ii) regioselective iii) chemospecific iv) regiospecific

f. Supercritical CO_2 is a.....
i) Green reagent ii) Green solvent
iii) Enzymatic catalyst iv) Green starting material

g. Citral is present in..... oil.
i) sesame ii) eucalyptus iii) lemon grass iv) mustard

h. $n \rightarrow \pi^*$ transition primarily occurs in .....region.
i) radiowave ii) UV iii) microwave iv) IR

5

C. **Match the column: (Any five)**

a. Photoisomerization	i. Heterocyclic compound
b. Thermodynamic term	ii. m/e = 43
c. Quinoline	iii. Biocatalysts
d. Rodenticide	iv Green Chemistry
e. Enzymes	v. λmax = 452 nm
f. Paul Anastas	vi. Cis-trans isomerism
g. β - Carotene	vii. Nucleophilicity
h. $-COCH_3$	viii. Controls rats and mice
	ix. Homocyclic compound
	x. Electrophilicity
